

THAUMATOCONCHA PIX, A NEW BATHYAL AND
ABYSSAL SPECIES FROM OFF SE AUSTRALIA
(OSTRACODA: HALOCYPRIDA: THAUMATOCYPRIDIDAE)

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Abstract.—*Thaumatoconcha pix* is described and illustrated from specimens collected at bathyal and abyssal depths (770–2900 m) from the continental slope off SE Australia. It is distinguished from previously described species by the morphology of the male copulatory organ. The genus has not been reported previously from the vicinity of Australia.

The family Thaumatocyprididae is of particular interest because of its unusual distribution (marine caves and the deep sea), which recently formed the basis for a hypothesis that the cave species are derived from shallow water habitats (Danielopol 1990), but the depths of the present occurrence (770–2900 m) does not add to or detract from that hypothesis. Members of the genus *Thaumatoconcha* have been collected at depths of from 150 to 4758 m between latitudes of about 32°N and 73°S in the Atlantic, Pacific, and Indian Oceans (Kornicker & Sohn 1976, Kornicker 1985), but none have been reported previously from the vicinity of Australia.

The specimens in this study are from collections made on the southeastern Australian continental slope during 1986 and 1988 by personnel of the Division of Natural History, Museum of Victoria, Victoria, Australia.

Disposition of specimens.—Three specimens have been deposited at the National Museum of Natural History, Smithsonian Institution, and have been assigned USNM numbers; remaining specimens have been deposited at the Museum of Victoria, Division of Natural History, Victoria, Australia, and assigned numbers.

Abbreviations.—The following abbreviations are used in the illustrations: am = central adductor muscle attachments; ant = an-

tenna; bas = basale; BO = Bellonci organ; brn org = brown organ; co = copulatory organ; end = endopodite; esop = esophagus; ex = exopodite; fu = furca; gl = gland; hl = hinge line; lft = left; ll = lower lip; prot = protopodite; rt = right; ul = upper lip. Arabic numerals indicate limbs 1–7 as well as individual joints of each limb (the location of the numeral indicating whether a limb or joint is indicated). Roman numerals indicate the endites. Letters applied to bristles are standard in the literature. The following abbreviations are used in legends: lv = lateral view; mv = medial view.

Station Data

Slope 6. New South Wales, off Nowra (34°51.90'S, 151°12.60'E), 770 m, crinoid dominated, WHOI epibenthic sled, 15 Jul 1986.

Slope 7. New South Wales, off Nowra (34°52.29'S, 151°15.02'E), 1096 m, shell, WHOI epibenthic sled, 15 Jul 1986.

Slope 25. Victoria, south of Point Hicks (38°25.90'S, 148°58.60'E), 1850 m, muddy, sandstone, WHOI epibenthic sled, 22 Jul 1986.

Slope 27. Victoria, south of Point Hicks (38°25.00'S, 149°0.00'E), 1500 m, compacted clay, WHOI epibenthic sled, 22 Jul 1986.

Slope 32. Victoria, south of Point Hicks

(38°21.90'S, 149°20.00'E), 1000 m, WHOI epibenthic sled, 23 Jul 1986.

Slope 53. New South Wales, 54 km ESE of Nowra (34°52.72'S, 151°15.04'E), 996 m, mud, fine sand, fine shell, WHOI epibenthic sled, 22 Oct 1988.

Slope 66. Victoria, 96 km S of Point Hicks (38°40.29'S, 149°18.06'E), 2900 m, compacted clay, WHOI epibenthic sled, 25 Oct 1988.

Slope 69. Victoria, 76 km S of Point Hicks (38°29.33'S, 149°19.98'E), 1840 m, sandy mud, fine shell, WHOI epibenthic sled, 26 Oct 1988.

Slope 81. Tasmania, 48 km ENE of Cape Tourville (42°00.25'S, 148°43.55'E), 1264 m, gravel with lumps of sandy mud aggregate, WHOI epibenthic sled, 30 Oct 1988.

Order Halocyprida Dana, 1853

Suborder Halocypridina Dana, 1853

Superfamily Thaumatoocypridoidea
Müller, 1906

Family Thaumatoocyprididae Müller, 1906

The Thaumatoocyprididae include three living genera of which only *Thaumatoconcha* Kornicker & Sohn, 1976, is in the present collection. Classification is that proposed by Kornicker & Sohn (1976).

Genus *Thaumatoconcha*
Kornicker & Sohn, 1976

Type species.—*Thaumatoconcha radiata* Kornicker & Sohn, 1976:35.

Composition.—Nine species are known in this genus including a new species described herein; in addition, several previous records have been left in open nomenclature (Kornicker 1985).

Distribution.—Between 32°N and 73°S at depths of 150–4758 m (Kornicker & Iliffe 1989:fig. 1).

Thaumatoconcha pix, new species
Figs. 1–3a–f

Etymology.—From the Latin *pix* (pitch).

Holotype.—Adult male with body sepa-

rated from shell in alcohol, in collection of the Museum of Victoria (J24007).

Type locality.—Slope 27, 38°25.00'S, 149°00.00'E: depth 1500 m.

Paratypes.—Slope 6, 2 undissected juveniles in alcohol (largest specimen: length 1.39 mm, height 1.13 mm). Slope 7, 1 specimen in alcohol. Slope 25, 2 specimens in alcohol. Slope 27, USNM 193894, adult male in alcohol and on slide (copulatory organ); USNM 193893, 1 adult male in alcohol and on slide; USNM 193895, 1 adult female in alcohol and on slide; 18 specimens in alcohol. Slope 32, 1 specimen in alcohol. Slope 53, 1 adult male and a total of 7 adult females and juveniles, all in alcohol. Slope 66, 4 specimens in alcohol. Slope 69, 68 specimens in alcohol. Slope 81, 5 specimens in alcohol (J24008–J24017).

Distribution.—Off SE Australia; known depth range 770–2900 m.

Remarks.—Because the carapace and most appendages of the new species are similar to those of the type species *T. radiata*, they are compared to that species in the description.

Description of adult male (Figs. 1–3a, b).—Carapace similar in shape and ornamentation to that of *T. radiata* (Fig. 1a). Free margin with numerous pore canals perpendicular to valve edge. Surface with widely separated slender bristles, many branching distally.

Central adductor muscle attachments (Figs. 1a, b, 3b): Typical for genus.

Carapace size (length, height in mm): Slope 27: holotype, 1.94, 1.66. Slope 25: USNM 193893, 1.97, 1.58.

First antenna (Fig. 1c–e): With 8 well-defined joints. 1st joint with medial spines and 2 spinous bristles (1 dorsal, 1 lateral oriented backwards). 2nd joint with medial spines and 2 spinous bristles (1 distoventral, 1 dorsal). 3rd joint with medial, ventral, and dorsal spines. 4th joint with dorsal spines and 2 long ventral bristles with distal widely separated minute spines. 5th joint with few minute dorsal spines and 3 ventral bristles (longest and stoutest with abundant long

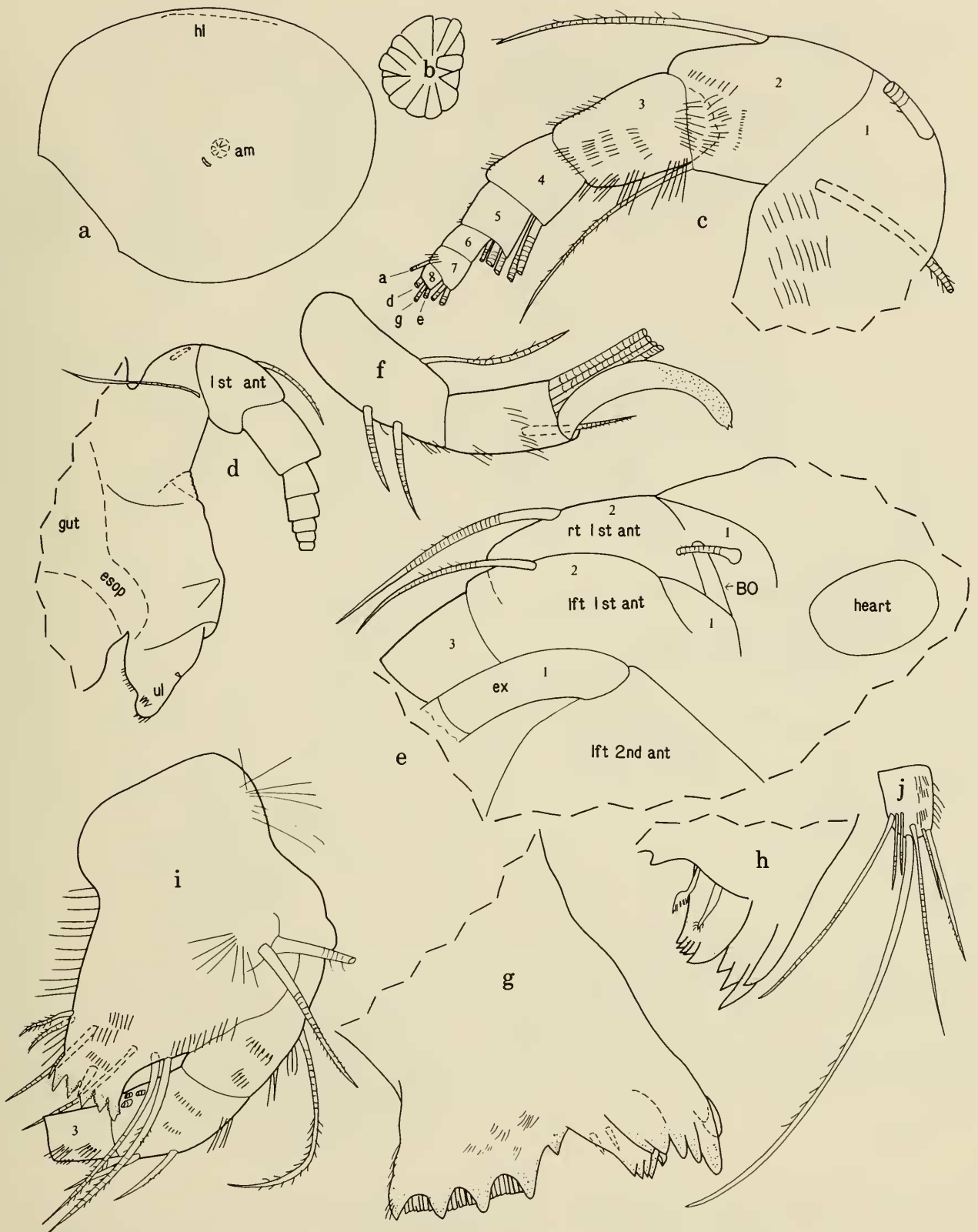


Fig. 1 *Thaumatoconcha pix*, adult male, paratype, USNM 193893: a, Complete specimen from left side, anterior to left, length 1.97 mm; b, Detail of central adductor muscles shown in "a"; c, Right 1st antenna, mv; d, Anterior part of body from right side (not all appendages shown); e, Anterodorsal part of body from left side; f, Endopodite of right 2nd antenna, mv; g, Distal end of coxale endite of right mandible, lv; h, Anterodistal corner of coxale endite of left mandible, mv; i, Basale and endopodite of left mandible (not all bristles of endopodite shown), mv; j, 3rd endopodial joint of left mandible, mv.

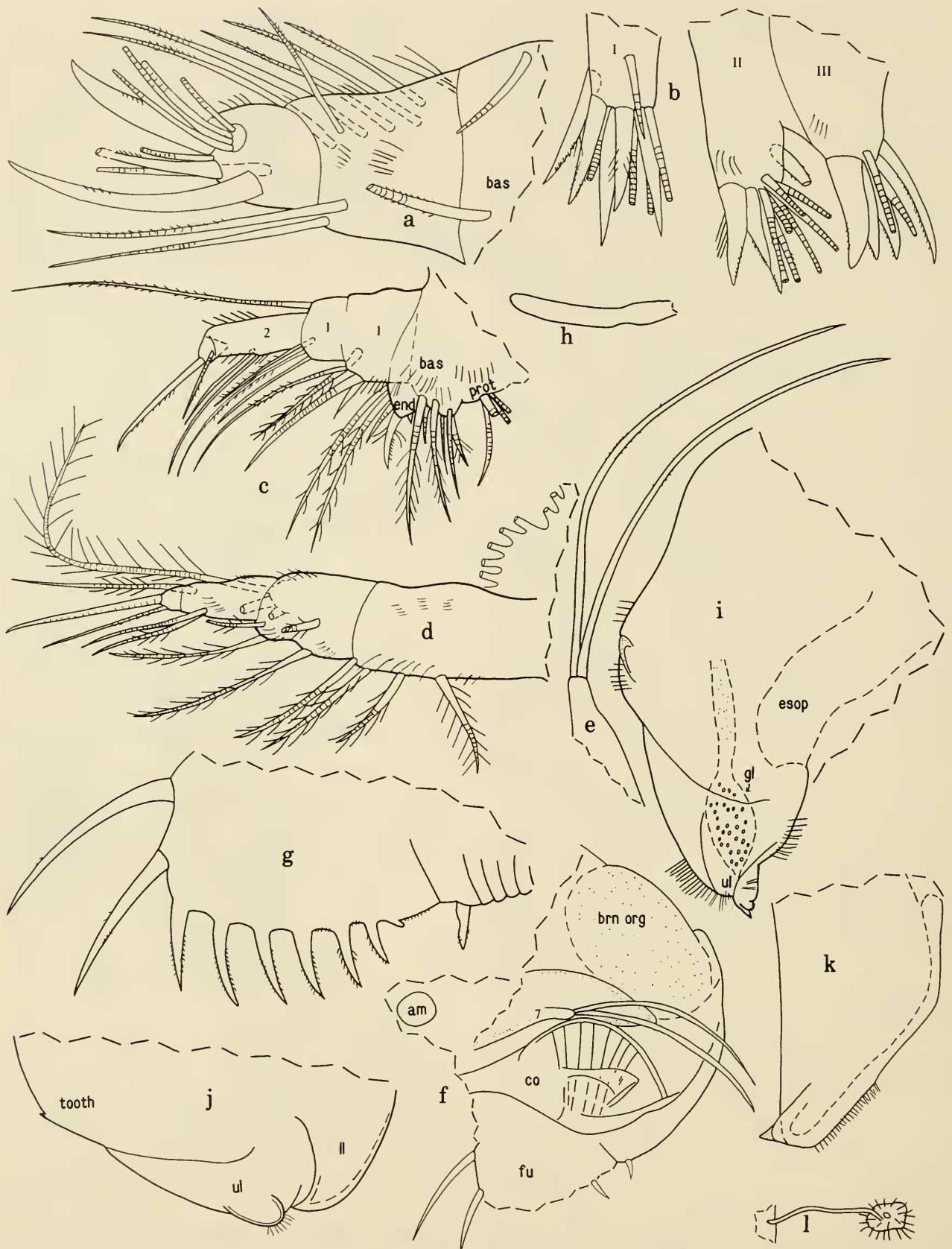


Fig. 2. *Thaumatoconcha pix*, adult male, paratype, USNM 193893: a, Maxilla (endites not shown); b, Endites of maxilla; c, 5th limb (epipodite not shown); d, 6th limb (only distal part of epipodite shown); e, Left 7th limb; f, Posterior of body from left side (not all appendages, furcal claws, or distal end of copulatory organ shown); g, Left lamella of furca; h, Bellonci organ; i, Anterior of body from left side (not all appendages shown); j, Upper and lower lips from left side; k, Lower lip from left side; l, Protistan attached to maxilla.

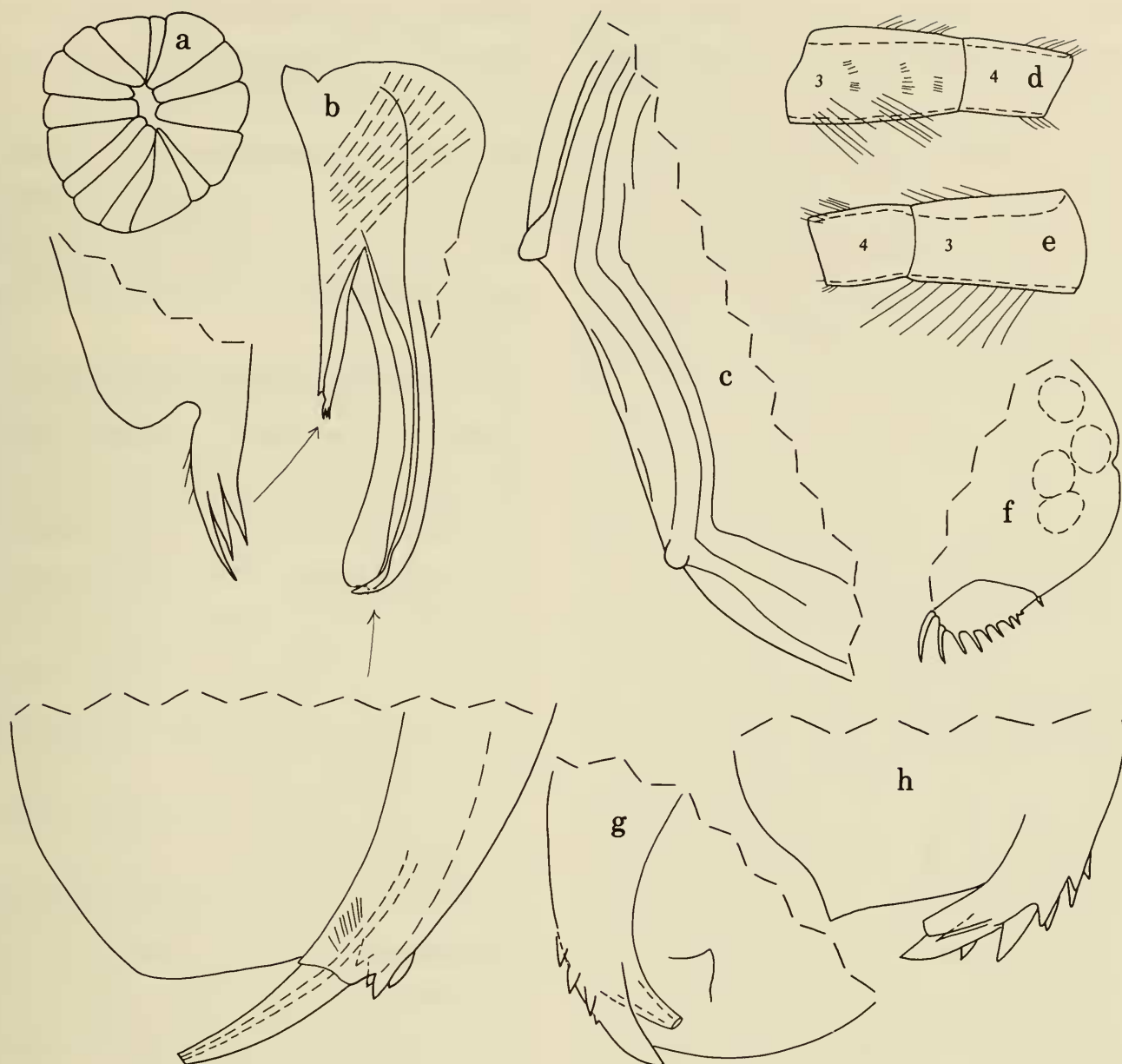


Fig. 3. *Thaumatoconcha pix*, adult male, paratype, USNM 193894, length 1.94 mm: a, Central adductor muscle attachments of left valve, lv; b, Copulatory organ with details of tips of anterior and posterior branches, anterior to right, mv. Adult female, paratype, USNM 193895, length 1.97 mm: c, Anterior of left valve, lv; d, e, joints 3 and 4 of left (mv and lv) 1st antenna; f, Posterior of body from left side showing unextruded eggs (dashed) and left furcal lamella. *Thaumatoconcha radiata* Kornicker & Sohn, 1976, adult male, paratypes, tip of anterior branch of copulatory organ: g, USNM 143753C, anterior to left (South Atlantic, 2707 m); h, USNM 126136E, anterior to left (Weddell Sea, 3035 m).

distal ventral hairs; next size with distal widely spaced minute spines; shortest with few minute spines). 6th joint bare. 7th joint with few indistinct medial spines, 1 short dorsal spinous a-bristle and 2 ventral bristles (b- and c-bristles; latter longer) with distal widely separated minute spines. 8th joint with short spinous dorsal bristle (base lateral (d-bristle)) and 2 longer ventral bristles

with widely separated minute spines (lateral much longer (e-bristle), other g-bristle).

Second antenna (Fig. 1e, f): Protopodite with rows of long spines along ventral margin. Endopodite 3-jointed (Fig. 1f): 1st joint with ventral spines and 3 bristles (1 dorsal, 2 ventral); 2nd joint with ventral and medial spines and 4 long terminal bristles near dorsal margin and 1 short spinous lateral bristle

near ventral margin; 3rd joint forming stout sclerotized hook with minute distal pustules and 2 minute terminal teeth. Exopodite with 9 joints; 1st joint with suture dividing it into long proximal and short distal parts; joints 2–8 with long bristles with natatory hairs and some also with slender ventral spines; 9th joint with 2 bristles (1 long with slender ventral spines and distal natatory hairs, 1 short with slender ventral and dorsal spines).

Mandible: Coxale endite with proximal and distal sets of teeth separated by small space with single low triangular tooth (Fig. 1g): proximal set with 4 teeth (proximal tooth with 1 pointed cusp, following teeth with 3, 4 and 3 cusps) with dense bundles of spines between teeth (spines also on medial and lateral surfaces proximal to teeth); distal set with 2 flat teeth (inner set with 5 or 6 cusps; outer set with 6 cusps) with 2 bristles (with spinous tips) at base (Fig. 1h). Basale (Fig. 1i): distal edge with 5 triangular cusps (anterior 4 with minute marginal serrations on proximal $\frac{2}{3}$); posterior margin of endite with long hairs and 2 bristles (proximal spinous, distal bare, tubular); anterior margin of endite with long spinous bristle; lateral side of endite with long hairs, 4 spinous bristles, and distal stout bare triangular tooth; medial side of basale near dorsal edge with 2 stout bristles on small mound. Endopodite 3-jointed (Fig. 1i): 1st joint spinous, with spinous dorsal bristle; 2nd joint spinous, with 3 ventral bristles and 2 distal dorsal bristles; 3rd joint hirsute with 7 bristles (Fig. 1j).

Maxilla (Fig. 2a, b): Endite I with 10 bristles; endite II with 11 bristles; endite III with 6 bristles (Fig. 2b). Basale with 2 bristles. 1st endopodial joint with 5 or 6 dorsal bristles and 2 ventral. 2nd endopodial joint with 9 bristles.

Fifth limb (Fig. 2c): Epipodite with bristles in 3 groups, each with 4 (distal group) or 5 bristles (not shown). Protopodite, basale, and endopodite with total of about 17 bristles including small tooth-like process on endopodite (some protopodial bristles

missing from drawing of illustrated limb). Exopodite 3-jointed: 1st joint with broad proximal part (with 4 bristles near ventral margin) and narrower distal part (with 3 bristles near ventral margin and 1 long dorsal bristle); 2nd joint with 2 bristles on or near ventral margin at midlength; 3rd joint with 1 short bristle and 1 long claw-like bristle (short bristle 42–57% length of long bristle).

Sixth limb (Fig. 2d): Epipodite with bristles in 3 groups (4 bristles in middle group, 5 bristles in distal group, proximal group fragmented; not all bristles shown). Protopodite with 4 hirsute bristles on or near ventral margin. Basale fused to 1st exopodial joint, with 2 hirsute bristles. Endopodite a small process with 3 long plumose bristles. Exopodite: 1st joint with 2 hirsute bristles; 2nd joint with 3 bristles (1 dorsal, 2 ventral); 3rd joint with 1 short bristle and 1 long claw-like bristle (short bristle 83–88% length of long bristle).

Seventh limb (Fig. 2e, f): Small with 2 long apical bristles.

Furca (Fig. 2f, g): Each lamella with 2 long articulated anterior claws followed by 6 short nonarticulated claws and 1 short recurved nonarticulated process. Most claws with indistinct minute teeth along margins (not all shown in illustrated furca). Neither lamella anterior to other.

Bellonci organ (Figs. 1e, 2h): Elongate with rounded tip.

Eyes: Absent.

Lips: Upper lip similar to that of *T. radiata* (Figs. 1d, 2i, j). Lower lip a triangular process at each side of mouth (Fig. 2j, k).

Anterior of body (Figs. 1d, 2i, j): Small sclerotized anterior tooth on each side of body dorsal to upper lip (stippled in Fig. 2i, j).

Posterior of body (Fig. 2f, g): Single slender tooth-like process present proximal to furcal lamellae. Posterior of body divided into narrow annulations (Fig. 2g).

Copulatory organ (Figs. 2f, 3b): Single organ on left side of body consisting of 2 parts:

tip of anterior part with single large tooth-like process with several small teeth at base; posterior part shorter than anterior part, with 3 teeth at tip.

Protostans: USNM 193893 with long-stalked protostans on 1st antennae, mandibles, and maxillae (Fig. 21).

Description of adult female (Fig. 3c–f).—Carapace similar to that of adult male (Fig. 3c).

Carapace size (length, height in mm): USNM 193895, 1.97, 1.78.

First antenna: Similar to that of female *T. radiata* except weak suture present between 3rd and 4th joints (Fig. 3d, e).

Second antenna: Limb similar to that of female *T. radiata*. 9th exopodial joint with 2 bristles (USNM 193893, left limb).

Furca (Fig. 3f): Similar to that of adult male. USNM 193893 with left lamella slightly anterior to right. Remaining appendages not examined in detail.

Eggs: USNM 193893 with 5 or 6 unextruded eggs (only 4 shown in Fig. 3f).

Comparisons.—In the known species of the genus, only *T. radiata* and *T. pix* have more than 1 or 2 teeth at the tip of the anterior part of the male copulatory organ. The 2 species differ in that the organ of *T. radiata* has 2 large terminal teeth whereas that of *T. pix* has only 1 (compare Fig. 3b, g, h).

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